Deuterium analysis reveals potential origin of the Fair Isle Citril Finch *Carduelis citrinella*

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Citril Finch *Carduelis citrinella*, one of Europe's few endemic birds, is restricted to the continent's central and south-west mountains (Cramp & Perrins 1994). Eighty per cent of the population is in Spain (Baccetti & Märki 1997), where it inhabits higher mountains from the Pyrenees in the north over the Sistema Iberico in the centre to the Sierra Nevada in the south. Elsewhere, Citril Finch occurs in the French Pyrenees, the Alps, the Black Forest, the Vosges, the Jura, Mont Ventoux and the Massif Central / Cevennes (Cramp & Perrins 1994). Generally, it is rarely recorded far from its preferred habitat of semi-open montane coniferous forests, especially those dominated by *Pinus* ssp. (Förschler & Kalko 2006). Records of vagrants were summarised in Hyndman (2008). Most of the accepted records are from areas close to the species' usual range and vagrancy potential must be considered quite low, making it unsurprising that Citril Finch has never been recorded in Britain before.

However, on 6 June 2008 a Citril Finch arrived on Fair Isle, Shetland, and was well documented with many photographs and video (Hyndman 2008). It remained there until 11 June. The bird was trapped and aged as an adult, based on Svensson (1992). All of the greater wing-coverts were of the same age, fresh and green-fringed. Furthermore, the rectrices were broad, rounded and fairly fresh, being more typical of older birds than first-years. However it is known that some individuals have a complete post-juvenile moult and would then resemble an adult, so the ageing of this individual cannot be absolutely certain. Further details were presented in Hyndman (2008). The record was recently accepted as involving a wild bird by the British Birds Rarities Committee (Hudson *et al.* 2010), and was placed in category A of the British list by the British Ornithologists' Union Records Committee (BOURC 2011), who argued that the bird was wild because the species is rarely kept in captivity and the individual showed no signs of captivity. A comparable case was previously recorded in Finland, where an adult female was trapped with Siskins *Carduelis spinus* in spring 1995 (Lindholm 1995). One of the Siskins had been trapped in Italy before and the Citril Finch perhaps joined a flock of Siskins there, en route to Finland. Nevertheless, this record was placed in category D by the Finnish rarities committee, due to the lack of similar records elsewhere (Hyndman 2008).

To acquire some idea of the possible geographical origin of the Fair Isle bird, we examined the deuterium values of several breast feathers shed during ringing. Using the hydrogen isotope tracer method proposed by Bowen *et al.* (2005), we obtained a value of δ D = -92.43, which is equivalent to a deuterium value in the precipitation of δ Dprec = -66.5 (Bowen *et al.* 2005). Citril Finches moult on the breeding grounds. Therefore, we used the Online Isotopes in Precipitation Calculator (Bowen & Revenaugh 2003, OIPC 2009) to compare this value with possible regions of provenance. We derived deuterium precipitation values for 100 sites across the species' entire breeding range and ordered them into six groups: (1) low mountains of the Sistema Iberico, Sistema Central, Cordillera Cantabrica (n=17), (2) high mountains of the Western, Central and Eastern Pyrenees (n=22), (3) low mountains of the Massif Central and Cevennes (n=13), (4) low mountains of the Black Forest, Vosges and Jura (n=12), (5) high mountains of the Western and Mediterranean Alps (n=10), and (6) high mountains of the Central and Eastern Alps (n=25). The Fair Isle feather was assigned a probability of origin for each of the six breeding regions based on a

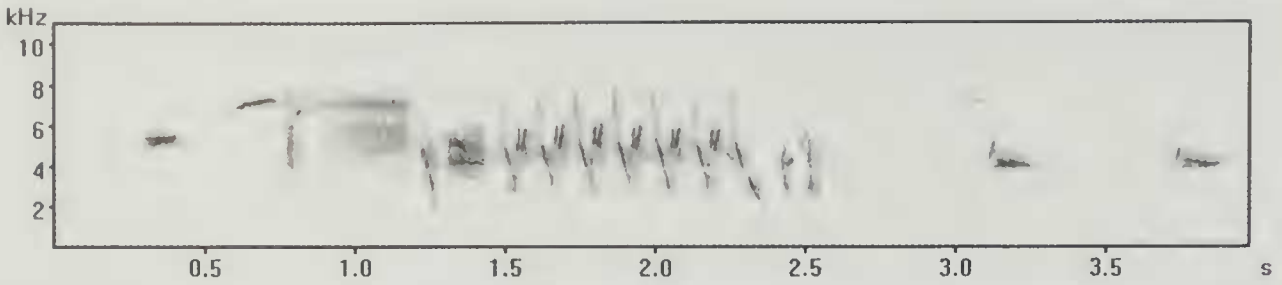

Figure 1. Song and two alarm calls of the Fair Isle Citril Finch *Carduelis citrinella* taken from a video by Liz Musser (http://vids.myspace.com/index.cfm?fuseaction=vids.individual&VideoID=35897570).

likelihood function (Wunder & Norris 2008). The assignment tests revealed high confidence values. Of the 100 times repeated samples, 48% had probability values of originating from the breeding region greater than 0.6, and 90% had probability values greater than 0.5. With a probability of 93%, the Fair Isle bird's origin might be area 4 (Black Forest, Vosges and Jura). Only 7% assigned it to area 6. Consequently, we may exclude that the bird originated from the southern Spanish mountains, the higher Pyrenees, the Massif Central / Cevennes and the Western Alps.

Analysis of the vocalisations of the Fair Isle bird revealed no clear pattern, because the number of available recordings was too small. However, the short length of the song and the compact trill at the beginning (Fig. 1) also favour a bird from more northerly breeding sites. Indeed, very similar song structures can be found in the Black Forest population (compare sonograms in Förschler & Kalko 2007).

That northern populations (areas 4–6) exhibit considerably stronger migratory behaviour (Zink & Bairlein 1995) than southern populations additionally supports a northern origin for the Fair Isle bird. Furthermore, the populations of area 4 are, with a min. distance of 1,350 km, closer to Fair Isle than any other Citril Finch population. However, in recent decades the species' populations in area 4 have declined dramatically (Förschler & Dorka 2010) which should diminish their vagrancy potential. Alternatively, the occurrence of an (apparent) adult in Scotland during the breeding season could even represent a sign of progressive population disintegration.

In summary, our data indicate that the most likely area of origin of the Fair Isle Citril Finch was the low mountains of the Black Forest, Vosges and Jura, in the north of the species' range. Together with the immaculate plumage observed in the hand, the data presented here argue in favour of it being a wild bird, as proposed by the BBRC (Hudson *et al.* 2010) and BOURC (BOURC 2011). However, given that the longest migratory distance recorded for Citril Finch is just 615 km (Cramp & Perrins 1994), it cannot be completely excluded that the bird was caught in the wild and then illegally transported further north.

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Notes on the nests of five species in south-eastern Ecuador, including the first breeding data for Black-and-white Tody-Tyrant *Poecilotriccus capitalis*

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Knowledge of the breeding ecology and seasons of Ecuadorian avifauna has increased exponentially during the last decade, based almost entirely on the work of the Yanayacu Natural History Research Group. Despite this increase in our understanding, many gaps remain, some of which are even possible for the casual observer to fill through wholly opportunistic observations. Here I describe breeding observations of five bird species, all in the province of Zamora-Chinchipe, south-east Ecuador, made during the course of other field work. For one species, Black-and-white Tody-Tyrant *Poecilotriccus capitalis*, the information presented here appears to represent the first breeding data for this poorly known bird. All measurements are estimates, unless otherwise stated.

STRIPED TREEHUNTER *Thripadectes holostictus*

A generally uncommon and somewhat patchily distributed Andean bird, from south-west Venezuela to north-west Bolivia (Ridgely & Tudor 2009), the first description of its nest and detailed breeding data were provided only very recently (Zyskowski & Greeney 2010). Together with J. Price, I discovered a nest of this species in a hole within a south-facing earth bank, overhung and sheltered by rootlets, along the Quebrada Honda trail in Tapichalapa Biological Reserve (04°30'S, 79°10'W), on 28 September 2010. Remarkably, the first nest of this species to be described in the literature was found in a very similar situation on the same trail, in November 2006 (Zyskowski & Greeney 2010). Precise measurements of the hole were not taken but were clearly similar to those reported by Zyskowski & Greeney